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ABSTRACT

In this study, Vygotsky's theory of the interpersonal origin and cognitive-developmental function of children's private speech is outlined and compared with Piaget's view of egocentric speech, and some contemporary North American research on children's private speech is reviewed. For the study, 32 preschool-aged children were videotaped during two sessions while they worked on story-sequencing tasks that had been adapted from the revised Wechsler Intelligence Scale for Children. Findings indicated that participants produced more private speech while working on difficult items than while working on easy items. The overall coefficient of egocentrism was negatively correlated with overall task performance and positively correlated with age. Analysis by functional and developmental categories of private speech showed a theoretically consistent reversal from the first session to the second session, from predominance of descriptive speech over planned, self-guiding speech, to predominance of the latter over the former. Advantages of a cross-session rather than single-session approach to studying private speech are discussed. (Author/RH)

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An Examination of Vygotsky's Theory of Children's Private Speech

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Abstract

Vygotsky's (1934/1987; 1978) theory of the interpersonal origin and cognitive-developmental function of children's private speech is outlined and briefly compared with Piaget's view of 'egocentric' speech. Some contemporary North American research on children's private speech is reviewed. In a study investigating Vygotsky's theory, 32 preschool-aged children were videotaped while working on story-sequencing tasks (adapted from the WISC-R), during two sessions. Participants produced more private speech while working on difficult items than on easy items, and the overall coefficient of egocentrism was negatively correlated with overall task performance. Also, the overall coefficient of egocentrism was positively correlated with age. Analysis by functional-developmental categories of private speech showed a theoretically-consistent reversal from the first session to the second session, from predominance of descriptive speech over planful, self-guiding speech, to predominance of the latter category over the former. The advantages of a cross-session rather than single-session approach to studying private speech are discussed.

An Examination of Vygotsky's Theory of Children's Private Speech

Private speech (also known as 'egocentric' speech) is common among children aged three to seven or eight years. Private speech is speech which is not functionally directed at other people, or which does not contain all the information necessary for its meaning to be understandable to a listener. In this latter sense, private speech can be said to be inadequately adapted to the perspective of the listener. Private speech is abbreviated and condensed, and seems to assume considerable prior knowledge about the speaker's actions.

Interest in private speech dates from Piaget's work in the 1920's, in the context of which the phenomenon was called 'egocentric' speech. This early work by Piaget stimulated Vygotsky to articulate an insightful dialectical materialist account of the developmental role of private speech. North American research interest in the Vygotskian theory of private speech began in the 1960's (for instance, Klein, 1963; Flavell, 1964; Kohlberg, Yaeger & Hjertholm, 1968), following publication of the first English-language translation of Vygotsky's Thought and Language (1934/1962). During the last decade, work on this topic has become increasingly common in the North American developmental literature.

To say that Piaget was interested in private speech - egocentric speech, as he referred to it - would be a somewhat misleading statement, since Piaget's theory did not attach an important or unique developmental role to this phenomenon. For Piaget, egocentric speech was an epiphenomenon of the child's basic cognitive egocentrism, the inability to cognitively decenter and take the psychological perspective of another person. Piaget's observations of egocentric speech served to confirm for him his theoretical account of psychological development as progressing from an initial individualized, "'autistic'" (Piaget, quoted in Vygotsky, 1934/1986, p. 16) condition, through a period of egocentrism, and finally to socialized, increasingly mature thought. Piaget did not consider egocentric speech to be of unique or special theoretical interest in the study of psychological development; he regarded it merely as an overt reflection of the child's egocentric thinking.

Vygotsky (1934/1986) criticized Piaget's assertion of the priority of autistic thought. The context of human living is a social context, and the young child's psychological processes are, in Vygotsky's view, a dialectical reflection of this social reality. The neonate's needs are provided for

exclusively through interpersonal contact, and the baby's need for stimulation is satisfied almost exclusively in interpersonal situations, frequently involving socially-defined cultural objects such as toys. Thus, the child's thinking is necessarily social in character, from a very early age.

Vygotsky believed that although Piaget recognized that this speech form was of scientific interest, "he remained entirely blind to the most important characteristics of egocentric speech" (1934/1987, p. 257). Vygotsky argued that egocentric speech is an emergent system of psychological tools, "an instrument of thought" (1934/1986, p. 31), undergoing a transformational process of interiorization. He proposed that egocentric speech is derived from interpersonal communication, and that it is gradually interiorized as a verbal form of thought. Vygotsky pointed out that his "theory suggests that the child's egocentric speech is one aspect of the general transition from inter-mental functions to intra-mental functions, one aspect of the transition from the child's social, collective activity to his individual mental functions" (1934/1987, p. 259). Whereas "in Piaget's view, egocentric speech arises from the inadequate socialization of what was originally an individual function," Vygotsky's position holds that "it arises from the inadequate individualization of an initially social speech" (p. 262). If the original function of speech is a social function, it follows that the very "notion that speech is socialized is incorrect in that it implies that speech was originally non-social" (p. 74).

Vygotsky believed that the linguistically-mediated guiding or regulatory influences which other people exercise on the actions of the child come to be applied by the child to his or her own actions. Thus, Vygotsky discerned a developmental transition from regulation of the child's conduct by others to increasingly effective self-regulation and self-control. Further, he asserted "that when egocentric speech disappears, it does not simply atrophy but 'goes underground,' i. e., turns into inner speech" (1934/1986, p. 32-33), and that "the same mental operations that the preschooler carried out through voiced egocentric speech are ... [in the process of being] relegated to soundless inner speech in schoolchildren" (p. 30). Vygotsky (1978) summarized the role of private speech in terms of four interrelated functions: it "enables children to provide for auxiliary tools in the solution of difficult tasks, to overcome impulsive action, to plan a solution to a problem prior to its execution, and to master their own behavior" (p. 28).

The Piagetian view of private speech suggests a monotonic decline in the

coefficient of egocentrism (that is, the percentage of a child's speech which is egocentric), with increasing mental age (MA) and socialization. Vygotsky's theory instead implies a curvilinear pattern of development (equivalent to a cubic trend), in the shape of an inverted U (see Kohlberg et al., 1968). This inverted-U function has a positive slope to about five years of age - as the new instrumental functions of speech emerge - and a negative slope after approximately five or six years - as what had earlier been external private speech is increasingly carried out internally.

Vygotsky and his student Levina carried out a variety of experimental research which illuminated several characteristics of children's egocentric speech. They found, for instance, that when children encounter obstacles or complications in the execution of a task, large increases occur in their production of private speech. Vygotsky (1978) performed experiments in which he incorporated a series of obstacles and difficulties into tasks carried out by children, and discovered "that in these difficult situations the coefficient of egocentric speech almost doubled" (p. 30), both compared to Piaget's reports, and compared to Vygotsky's own control data. This observation was made in a variety of different task contexts.

Vygotsky (1978) and Levina (1979) describe experiments in which preschool-aged children tried to obtain candy placed out of reach in a tall cupboard, using aids such as sticks, and chairs to stand on. They found that as the child became increasingly engaged in the task of obtaining the candy, speech became incorporated into the task as a problem-solving instrument - verbal regulation and planning "began to manifest itself as part of her active striving" (Vygotsky, 1978, p. 25). The more complexly mediated or abstract the psychological strategies required in a given task situation, the more important becomes the function of private speech. If a child is prevented from making use of private speech at a complex or difficult moment in a task, the child may not be able to carry on with the task. Frequently, it was discovered, attempts to prevent children from producing private speech upon encountering difficulties were futile.

This research also showed that as a child becomes increasingly practised at or familiar with a task or action, the occurrence of private speech shifts from the end of the action to the beginning. Vygotsky (1934/1986) reported: "We observed how egocentric speech at first marked the end result or a turning point in an activity, then was gradually shifted toward the middle and finally to the beginning of the activity, taking on a directing, planning

function and raising the child's acts to the level of purposeful behavior" (p. 31). With such a shift, speech "starts serving as a mediator in purposive activity and in planning complex actions" (p. 39).

North American Research on Vygotsky's Account of Private Speech

Numerous facets of Vygotsky's theory of private speech have been examined by North American researchers. In one of the earliest of these works, Kohlberg et al. (1968) reported four studies of preschool and school-aged children's private speech. These researchers proposed a developmental sequence of six categories of private speech antecedent to its full interiorization. Earlier categories in this sequence are thought to occur more frequently in the speech of young children, with the higher categories becoming more common with increasing MA. This classification system is as follows:

Category 1: Word play and repetition;
Category 2: Remarks addressed to nonhuman objects;
Category 3: Describing own activity (generally in present verb tense);
Category 4: Questions answered by the self;
Category 5: Self-guiding comments (often references to nonvisible aspects of the situation);
Category 6: Inaudible or indecipherable muttering.
(see Kohlberg et al., 1968, p. 707-708)

After this last category of 'muttering,' private speech comes to be carried out in an internal form, and increasingly-mature verbal thought emerges, in the form of silent 'inner speech.' The Kohlbergian sequential model has served as a prototype for coding systems used by some later researchers (for instance, Rubin, Hultsch & Peters, 1971; Deutsch & Stein, 1972; Berk & Garvin, 1984; Berk, 1986; Frauenglass & Diaz, 1985).

Kohlberg et al. (1968) reported four studies investigating children's private speech and assessing the feasibility of their classification system. Support from these studies for the sequentiality of the private speech categories was not strong. Kohlberg et al. found developmental differences in the relationships between private speech production, age, and IQ, differences consistent with the Vygotskian account of MA-related interiorization of private speech. These researchers also reported IQ-related differences in the ages at which coefficients of egocentrism peaked, supporting the inverted-U pattern of private speech development

implied by the Vygotskian approach.

In the fourth study, preschoolers worked on four tasks: bead stringing, building with cubes, a relatively easy jigsaw puzzle, and a more difficult jigsaw puzzle. The former two tasks were considered by Kohlberg et al. (1968) to be less difficult than the easy puzzle, which was in turn easier than the difficult puzzle. Assuming this ordering of task difficulty, results replicated Vygotsky's (1934/1987, 1978) observations concerning private speech and difficulty: children produced more private speech while working on the difficult puzzle than the easy puzzle, and more on the easy puzzle than on the other two tasks. Kohlberg et al. (1968) also reported analyses of this data set showing no gender differences in private speech production.

Frauenglass and Diaz (1985) examined two issues in the North American literature on private speech. First, Frauenglass and Diaz pointed out that most private speech studies "report occurrences of private speech for only half of the children in their samples," but suggest that this "scarcity of private speech is an artifact of the typical research paradigm used in recent investigations" (p. 357). This typical procedure includes having subjects perform nonverbal tasks such as puzzles, mazes, or block tasks, which may not directly involve verbal mediation. Further, subjects are not typically given any instructions with regard to talking during performance of the tasks, possibly creating an artifactually low level of speech because participants assume talkativeness is discouraged. In their study, then, Frauenglass and Diaz incorporated four tasks, two of which were of a perceptual character (a puzzle and a block design task) and two of a semantic nature (object-classification and story-sequencing tasks, using sets of picture-cards), and subjects either were or were not instructed to talk aloud during the task.

The second issue dealt with by Frauenglass and Diaz (1985) concerns the observation that "a large number of studies have failed to show a functional relationship between private speech and success in cognitive tasks" (p. 357), and "have not revealed a positive effect of children's spontaneous private speech on task performance" (p. 358). This is not, however, contradictory to Vygotsky's theory, as the authors explain: "private speech is most likely to co-occur with failure in cognitive tasks because both private speech and the likelihood of failure increase with task difficulty" (p. 358).

Analyses indicated a main effect on private speech production for type

of task, as expected, but no effect of instructions to talk during the task. The two semantic tasks were found to be accompanied by significantly more private speech than the two perceptual tasks. Presumably, semantic problems elicit more private speech than perceptual problems because they "must be solved along semantic dimensions and, therefore, are facilitated by the use of language" (p. 363) as a problem-solving instrument. In connection with the second issue, it was found that performance levels were lower for children with high levels of private speech production, suggesting - in accordance with Vygotskian theory - that children may tend to use private speech most on tasks they find very difficult, rather than on easier tasks, and thus tend to encounter failure when using private speech.

Behrend, Rosengren and Perlmutter (1989a) investigated the relations of task difficulty and age with private speech production. The participants in this study ranged in age from two to five years; the data were separated for analysis into three age groups: approximately two years old, three and a half years old, and five years old. Participants worked on two sets of three progressively more difficult puzzles. Correlational analyses indicated that private speech was positively related to task performance, on the puzzle tasks of moderate and high difficulty (the second and third puzzles in each of the two sets). Private speech was found to increase with age in this sample, which - given the age range of the sample - is in accordance with Vygotskian theory. It was also found to be curvilinearly related to puzzle difficulty - that is, children produced more private speech while they worked on puzzles of moderate difficulty than when they worked on easy or difficult puzzles. Presumably, the easy puzzles were not sufficiently challenging to elicit private speech from these children, whereas the difficult puzzles were excessively demanding, overwhelming the children such that they were unable to apply private speech strategies, and reverted instead to other, prelinguistic forms of problem-solving. Overall, as Behrend et al. suggest, these findings support the idea "that private speech varies systematically with age and task difficulty in a manner that confirms the self-regulatory function of private speech" (p. 319).

Behrend, Rosengren, and Perlmutter (1989b) investigated relationships between private speech, maternal scaffolding, and task performance. Effects of private speech and scaffolding on future as well as current performance were assessed. Behrend et al. reasoned that since private speech is regarded in Vygotskian theory as being in the process of interiorization, it should be

diachronically related to task performance, with production of private speech while working on a task at one time predicting performance on the task on a future attempt at a second time. This is compatible with the finding of a negative relationship between private speech and immediate performance, reported by Frauenglass and Diaz (1985). Participants in this study were preschoolers and their mothers. The study involved two observational sessions, one week apart. During the first session, children were videotaped while working on two sets of three progressively difficult puzzles, one set alone and the other with their mothers; in the second session, they were videotaped while working only on the two most difficult puzzles, one alone and one with maternal participation. Videotapes were coded for children's private speech and a composite measure of maternal scaffolding. Stepwise regression analysis showed that when added to a model including age and first session performance as predictors of second session performance, first session private speech made a significant positive contribution to the prediction. Among younger children, maternal scaffolding was found to be positively related to private speech production in the joint task situation. Whereas it was found that scaffolding by mothers was synchronically related to task performance, predicting performance within a single session, private speech - as expected - was diachronically related to performance.

Further evidence regarding the diachronic nature of the relationship between private speech and task performance comes from a recent longitudinal study by Bivens and Berk (1990). Thirty-three children were observed in their classrooms, working individually on arithmetic, when they were in the first, second and third grades. Observational settings of this kind appear highly suitable for recording private speech: Bivens and Berk report occurrences of private verbalizations for all 33 participants in the study. Across the three years, private speech classified as Level 1 (including utterances in the Kohlbergian categories 1 and 2, as well as other types) and Level 2 (including the Kohlbergian categories 3 and 4) declined linearly. Level 3 private speech (including Kohlbergian category 6), on the other hand, increased with grade level. These trends both support the suggested sequentiality of the system of categories proposed by Kohlberg et al. (1968), and corroborate Vygotsky's (1934/1987) observations of reductions in children's overt private speech during the early school years. Private speech production and arithmetic marks were largely uncorrelated

within each year, but Level 2 and Level 3 private speech during grade 1 were positively correlated with arithmetic performance during grade 2, and Level 3 private speech in grade 2 was positively related to performance in grade 3. This pattern of relationships suggests that the facilitative effect of private speech may occur over a relatively long time period, necessitating the use of longitudinal methodology in order to fully apprehend it.

Several questions following from this review were addressed in the present study. Preschool-aged children were videotaped during two sessions, while they arranged sets of pictures to make brief stories. During the first session, half of the children were scaffolded on the tasks by the experimenter, while the other half were not; during the second session, all participants worked on the tasks alone. During the first session, participants worked on easy and difficult story-sequencing tasks. During the second session, they worked on familiar and novel items; the former were "familiar" in that they had been presented during the first session, whereas the novel items had not.

This design permitted examination of a number of hypotheses: (1) during the first session, children would produce a greater number of private utterances while working on the difficult items than on the easy items; (2) during the second session, children would produce more private utterances while working on the novel items than on the familiar items; (3) participants assigned to the scaffolded condition for the first session would produce more private utterances during the second session than participants who were not scaffolded (following Vygotsky's specification of the social, interpersonal origin of private speech, as discussed above); (4) advances should be observed, across sessions, in functional-developmental forms of private speech; and (5) private speech would be uncorrelated or negatively correlated with task performance within a single session, but first session private speech should be positively correlated with second session performance (based on findings reported by Behrend et al., 1989b).

Using a categorical system for private speech classification resembling that of Kohlberg et al. (1968), changes were examined across the two experimental sessions in the relative frequency of private utterances in the various categories. Generally, it was expected that movement would occur across sessions from less advanced to more advanced categories. Of more specific interest are changes in the relative frequencies of the two categories, 'Describing own activity' and 'Self-guiding comments.' It was

expected that with increasing familiarity with story-sequencing tasks from the first to the second session, a reduction would occur in participants' production of utterances classified as 'Describing own activity,' and an increase would occur in the frequency of 'Self-guiding comments.' This corresponds generally to Vygotsky's observations of movement in the positioning of private speech from the end of an act (where it serves as a commentary on the act's outcome) toward the beginning of the act (where it serves a purposive planning function), since descriptors would logically tend to occur either simultaneously with or after a given action, whereas self-guidance is of a planful character and thus tends to occur prior to a related action.

Method

Subjects

Participants in this experiment were 32 children (16 girls and 16 boys) aged 4 years, 1 month to 5 years, 11 months (mean age 4 years, 10 months), in attendance at daycare centres in Waterloo, Ontario, Canada.

Materials

Materials and equipment included story-sequencing tasks and audiovisual equipment. The experimental story-sequencing tasks were adapted from the Picture Arrangement subscale of the Wechsler Intelligence Scale for Children, Revised (1974). Items 2, 3, 4, and 5 were used as 'easy' items; items 6, 7, 8, 9, 10, and 12 were used as 'difficult' items. Items 1 and 11 were omitted. The practice items consisted of one item from the WISC-R, one "homemade" item, and three items from the Photo Series Cards of the Kaufman Assessment Battery for Children (1983). A VHS videocassette tapedeck, camera and tripod were used to record the sessions.

Procedure

A female experimenter conducted the sessions with half of the participants, and a male experimenter conducted the sessions with the others.

First session. First sessions lasted approximately 20 minutes. Each participant was initially read a short children's story by the experimenter. Then the basic requirement of the story-sequencing task (rearranging each set of pictures to create a coherent story) was explained. The story-sequencing items were presented one at a time, in blocks of four. A practice phase consisting of two or three items preceeded both blocks of experimental items. The experimenter first demonstrated the solution to

each of these practice items, then asked the child to carry it out. Collaborative assistance based loosely on a scaffolding procedure was provided as needed to all participants, regardless of experimental condition, while they worked on the practice items.

Following each practice period, participants were given four WISC-R items to work on; the card sets were laid out one at a time by the experimenter on a table in front of the subject. For half of the participants, the block of easy items was presented first, followed by the difficult block, while for the other half this order was reversed.

Participants assigned to the scaffolded group were given collaborative assistance by the experimenter while they worked on the tasks. This assistance constituted a loosely organized pattern of scaffolding, consisting of various verbal prompts, queries and leading questions of graduated explicitness, used approximately in inverse relation to participants' ongoing task performance. Children in the independent condition received no assistance while working on the experimental tasks. Each participant in this group worked on these items alone, while the experimenter sat with his or her back to the child, trying to look occupied with some papers at another table 8 to 10 feet away. The experimenter provided the participant with the story-sequencing cards one set at a time; when the subject finished arranging each set of cards, he or she called the experimenter, who laid out the cards for the next item and sat down again at the other table.

Second session. Second sessions followed first sessions by approximately one week. As in the first session, a short children's story was read to each participant before beginning the experimental procedure. Several practice items were carried out jointly, before the experimental items. Following the practice phase, each subject worked on four WISC-R items. Two of these were items which had been included in the difficult block during the first session, and two were novel difficult WISC-R items. In this session, no participants were scaffolded on the tasks, after the practice phase; instead, all worked independently on the four experimental items. The experimenter again sat at another table with his or her back to the participant. Second sessions lasted approximately 10 minutes.

Measures of performance on the story-sequencing items were obtained for independent condition participants during the first phase, and for all participants during the second phase. These measures consisted of one point assigned for each set of pictures correctly sequenced. (First session

performance measures for scaffolded condition participants were not recorded, since in all cases these subjects had perfect performance scores due to the assistance provided by the experimenter.)

Classification of private speech. All utterances made by participants while working on the experimental (not the practice) story-sequence items were (1) classified as private or social utterances and (2) if private, then placed in one of six private speech categories, in accordance with the following classification system:

The 'utterance' unit was defined in one of two ways: (1) if the subject did not speak for at least two seconds before and after a verbalization, the verbalization was considered a discrete utterance; or (2) if the verbalization was not temporally isolated from other verbalizations by at least two seconds but was distinctly an accompaniment to a single story-sequence card placement act (that is, the verbalization began and ended more or less simultaneously with the act), the verbalization was considered a discrete utterance.

Classification of an utterance as private or social was based on whether the particular utterance was associated with either eye contact or social interaction with the experimenter; if one of these conditions obtained, an utterance was considered social. If the utterance involved neither eye contact nor social interaction, it was considered private. Most private utterances were easily distinguished by clear lack of communicative intent, abbreviation of linguistic structure, functional content, or voice inflexion and intonation characteristics.

The six categories of private speech used in this study were as follows:

Category 1: Word play and repetition;
Category 2: Describing own activity;
Category 3: Self-answered questions;
Category 4: Self-guiding comments;
Category 5: Muttering or mumbling;
Category 6: Nonlinguistic utterances.

The major difference between this classification scheme and that of Kohlberg et al. (1968) is the omission of the category 'Remarks addressed to nonhuman objects' (due to nonoccurrence), and addition of the category, 'Nonlinguistic utterances' (utterances which, although they might not be considered "speech" as such, nonetheless are "speech-for-oneself," in terms of function - for example, utterances such as "Umm" and "Hmm"). This alters

the overall sequentiality of the system, posited by Kohlberg et al., since there is no theoretical basis on which to place the new category within the sequence. The only clear developmental trend expected in this study (as noted above) involves the categories 'Describing own activity' and 'Self-guiding comments.'

One observer viewed the videotapes of all the experimental sessions. An independent observer made classifications of the utterances in four randomly chosen sessions. On classification of utterances as private or social, 100 % inter-observer agreement was obtained. Of the utterances produced by participants in these four sessions, 51 % were categorized as private speech; 100 % agreement between observers was also obtained on classification of these utterances into the six private speech categories.

Results

In the scaffolding situation, participants produced no speech classified as 'private,' due to continuous social interaction with the experimenter; for this reason, analyses involving first-session data are based on observations of independent condition subjects only. The overall coefficient of egocentrism in this study (excluding first-session speech by scaffolded subjects) was 26.4 %.

During each session, 56 % of the children produced private speech. Of the 16 independent condition participants, 7 produced private speech during both sessions, and 5 during neither; 4 subjects produced private speech during one session but not the other (see Table 1). This outcome can be regarded as a binary distribution, with 12 participants classified alike during the two sessions and 4 classified differently. The binomial test supports the claim that subjects were more likely than not to be classified the same in both sessions, $p<.05$ ($p=q=.5$, $N=16$).

Participants produced a greater number of private utterances while working on the 'difficult' items than on the 'easy' items; applying the Wilcoxon matched-pairs signed-ranks test, T ($N=8$) = 1, $p<.01$ (see Figure 1). The expected difference in number of private utterances between 'novel' and 'familiar' items was not observed, T ($N=8$) = 48.5, n. s. (see Figure 2).

Participants who had been scaffolded during the first session did not produce more private utterances during the second session than those not scaffolded; by the Wilcoxon rank sum test, W_s ($N_1=N_2=16$) = 263, n. s. A statistically marginal tendency was observed for the private speech

produced by participants in the scaffolded condition to occur more in the developmentally advanced categories of the original Kohlbergian system (that is, 'Self-guiding speech' and 'Muttering') than in the less advanced categories ('Word play' and 'Descriptions of own activity'), T (N=8) = 29, p<.08 (see Figure 3). No such pattern was evident among independent condition participants.

Four of the six private speech categories employed in this study did not show appreciable changes across sessions (see Figure 4). The category 'Descriptions of own activity' went from 54 % of total private utterances during the first session to 22 % during the second session, and 'Self-guiding speech' went from 21 % during the first session to 51 % in the second (see Figure 4).

As expected, private speech (in terms of both number of private utterances and coefficient of egocentrism) and task performance were uncorrelated, both within the first and within the second session (see Table 2). First-session private speech and second-session performance were also uncorrelated, contrary to prediction; thus, the hypothesized cross-lagged pattern was not observed.

Additional correlational analyses showed that (1) overall coefficient of egocentrism (excluding first-session speech by scaffolded subjects) was positively associated with age, r_s (N=32) = .367, p<.05, and that (2) overall coefficient of egocentrism was negatively correlated with overall task performance, r_s (N=32) = -.485, p<.01 (see Table 3).

A gender difference also emerged during the second session, in terms of private speech production. Boys were more likely than girls to produce private speech, χ^2 (1, N=32) = 5, p<.05 (see Table 4). Among independent condition participants during the first session, no such difference was evident.

Discussion

A number of outcomes in this experiment provide firm evidence in favour of the Vygotskian account of the function and development of children's private speech. The difference between participants' private speech production while working on difficult tasks and easier tasks, for instance, clearly replicates observations reported by Vygotsky (1934/1987, 1978) and others (Kohlberg et al., 1968; Beaudichon, 1973). The lack of difference in private speech between familiar and novel tasks could be due to

insufficient practice with the familiar items: it may be that if children worked on repeated items during more than two sessions, differences of the kind predicted in the present study might be observed. Research currently under way addresses this possibility.

The tendency for the second-session private speech of participants in the scaffolded group to be classified in the more developmentally advanced Kohlbergian categories suggests that their verbal self-regulation on the story-sequencing tasks was somewhat enhanced by the earlier collaboration with the experimenter. The lack of an overall quantitative difference between scaffolded and independent subjects may have been brought about by the length of the one-week lag between sessions; possibly with a shorter interval between sessions, a more general difference might be observed.

The pattern of relative reversal across sessions in the frequencies of the Kohlbergian categories 'Descriptions of own activity' and 'Self-guiding speech' strongly supports Vygotsky's theory. This pattern basically parallels Soviet reports of a developmental shift in the location of private utterances from the end or middle of an action toward the beginning of the action (Vygotsky, 1934/1987, 1978; Levina, 1979). Observations in the present study suggest that with increasing familiarity with the story-sequencing task, children tended to use speech more as an instrument of planning, and less as commentary on concomitant actions. This is a novel finding in the context of the contemporary research literature on private speech. Further research currently under way will assess the generality of these microgenetic changes.

The lack of noteworthy changes in the frequencies of other private speech categories in the Kohlbergian system is perhaps not surprising, since it is not clear that the rationale underlying this model would lead to predictions of changes. Kohlberg et al. (1968) regard these categories more as MA-related developmental stages than as microgenetically-dynamic functional forms; in this light, it would seem that not much change is to be expected over the period of one week.

The absence of a cross-lagged pattern of correlation between first-session private speech and second-session task performance, like that reported by Behrend et al. (1989b), could potentially have been produced by the small sample size used in calculating the correlation coefficient. (Recall that data from the 16 independent condition participants only were used for this statistic; see Table 2.) Another possibility is that the

facilitative effect of private speech is better suited to longitudinal analysis than to short-term microgenetic experimentation. A microgenetic study currently under way will provide another opportunity to assess short-term cross-lagged relationships, across a series of three sessions.

The negative correlation between overall private speech and task performance (see Table 3) supports suggestions made by Frauenglass and Diaz (1985). These researchers proposed that the tendency to produce more private speech while working on tasks of greater difficulty accounts for relationships of this kind: when working on tasks they find difficult, children tend both to produce private speech, and to have poor task performance.

The positive correlation between private speech and age in this study (see Table 3) is also readily interpreted in terms of the Vygotskian account. Given the age range of the children in this sample (4 years, 1 month to 5 years, 11 months), one would expect most of them to be in the earlier, positive slope phase of the inverted U curve (when private speech production increases with age), and few, if any, to be in the later, negative slope phase.

The gender difference found in this study is apparently without precedent in research on private speech. Assignment of subjects was constrained such that half of the children participating with each experimenter were of each gender, providing the opportunity to observe possible interactions between experimenter gender and participant gender. This constituted an attempt to account for the tendency for only about half of the children in samples used in many studies to actually produce private speech (as noted by Frauenglass & Diaz, 1985), a tendency which can be regarded as somewhat problematic for Vygotsky's theory. This attempt was based on the notion that children might be less likely to produce private speech in the presence of a different-gender adult experimenter than in the presence of a same-gender experimenter. Such a pattern was not found; instead, boys in this group were more likely to produce private speech than girls, overall (see Table 4).

Evaluation of the number of participants in this study producing private speech during one session but not the other also provides evidence related to this 50 % split found by many researchers. Results of this study suggest a degree of cross-temporal consistency as to whether or not individual preschoolers produce private speech in an observational situation (see Table 1). Findings reported by Biven and Berk (1990), who observed private speech by all the children in their study, while doing arithmetic, support the

suggestion that the specific task context is a crucial component in private speech research.

Inclusion of two sessions in this study did, however, facilitate observation of private verbalization among 69 % of independent condition participants, during at least one session (compared to 56 % within each of the two sessions; see Table 1). Ongoing research incorporates an extension of this approach, through comparison of single-session proportions of children producing private speech with cumulative proportions across a sequence of three sessions.

On balance, the findings of this study provide considerable support for Vygotsky's account of children's private speech. The methodological advantages of the cross-session, repeated measures approach taken in this study over a single-session design are clear. The design employed in the present study facilitated apprehension of shifts across sessions in private speech forms, shifts corresponding to observations reported by Vygotsky (1934/1987, 1978) and Levina (1979). This approach also brought about observation of private speech from well over half of the participants. Ongoing research implementing a three-session experimental design is likely to provide further evidence concerning these and other aspects of Vygotskian theory.

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Table 1
Independent Condition Participants Producing Private Speech During Session 1 and Session 2

Session 2	Session 1: Private Speech	Session 1: No Private Speech
Private Speech	7	2
No Private Speech	2	5

N=16

Application of the binomial test indicates that participants were more likely to be classified in the same categories for both sessions than to be classified differently, $p < .05$.

Table 2
Spearman Rank Correlations Between
Private Speech and Task Performance

	Task Performance (%)	
	Session 1	Session 2
Number of Private Utterances During Session 1	.03 N=16	.28 N=16
Coefficient of Egocentrism During Session 1	.00 N=16	.37 N=16
Number of Private Utterances During Session 2		-.17 N=32
Coefficient of Egocentrism During Session 2		-.20 N=32

Table 3
Spearman Rank Correlations
Between Overall Private Speech,
Overall Task Performance, and Age

	Overall Performance	Age
Overall Number of Private Utterances	.02	.29
Overall Coefficient of Egocentrism	-.49 $p < .01$	.37 $p < .05$

N=32 for all cells

Table 4
Private Speech Production X Gender, in Session 2

Gender of Participants

	Female	Male
Private Speech	6	12
No Private Speech	10	4

N=32

χ^2 (1, N=32) = 5.00, $p < .05$.

Figure 1
Easy vs. Difficult Items

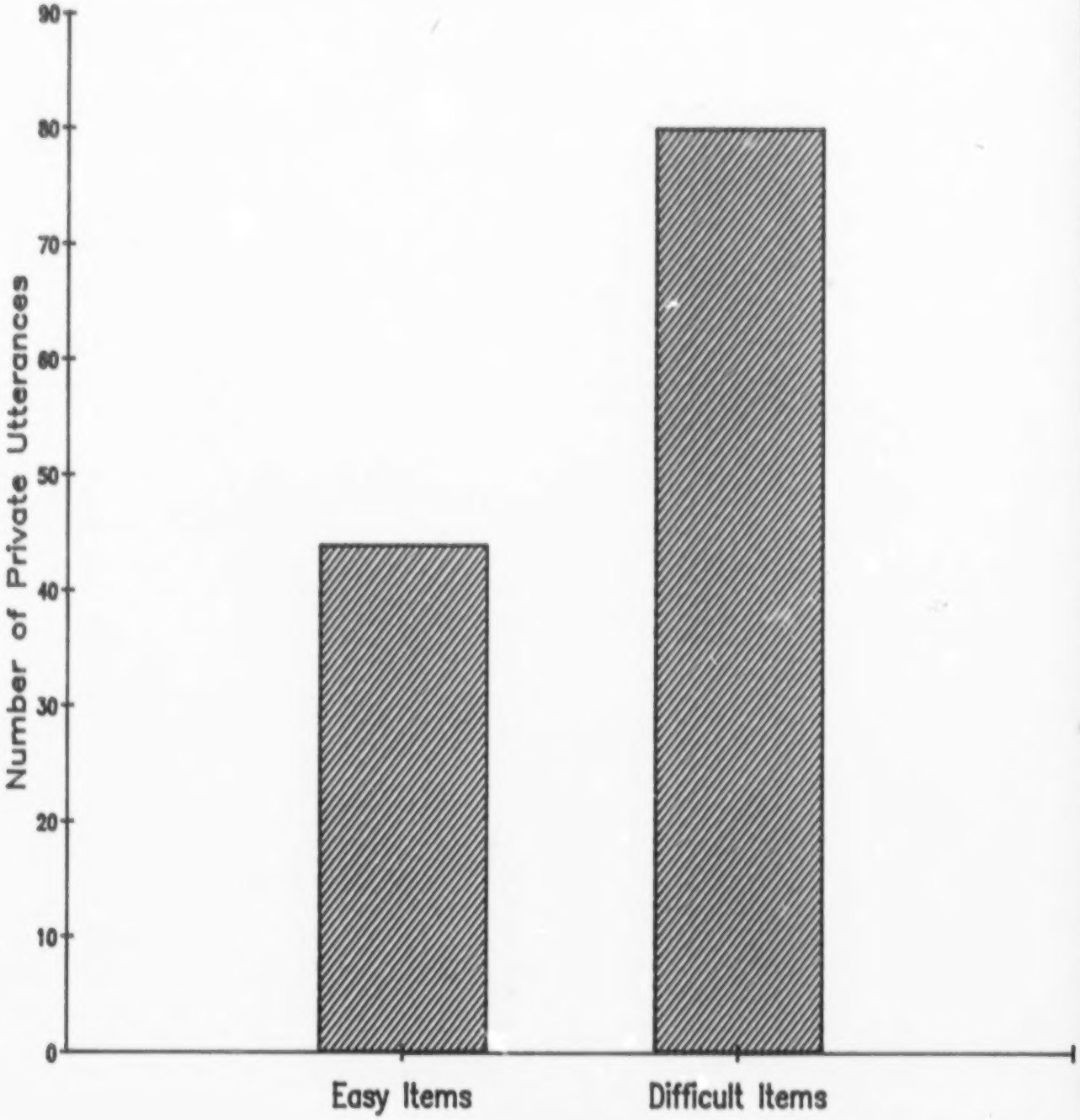

Figure 2
Familiar vs. Novel Items

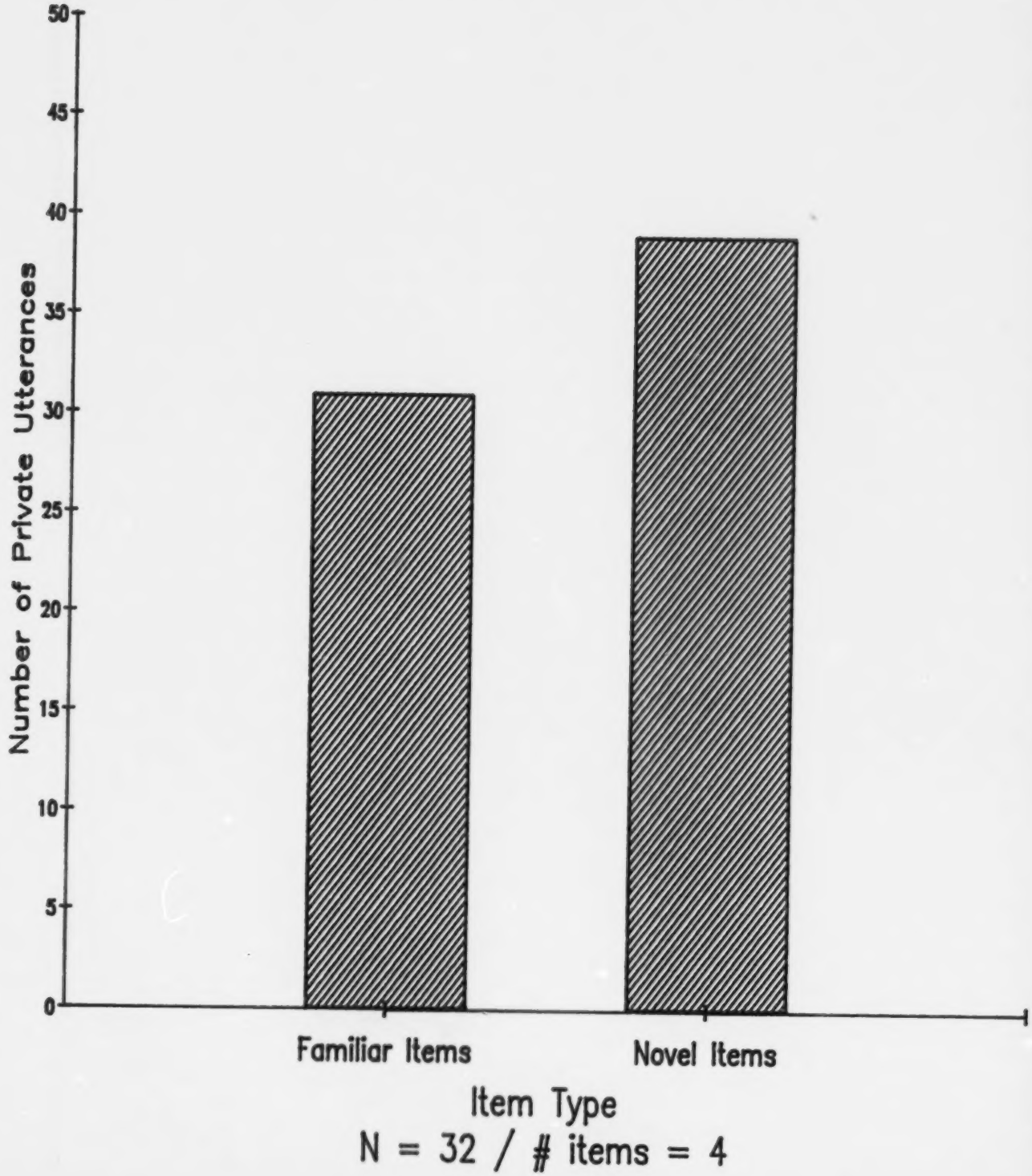

Figure 3
Second Session Production of Kohlbergian Categories X Condition

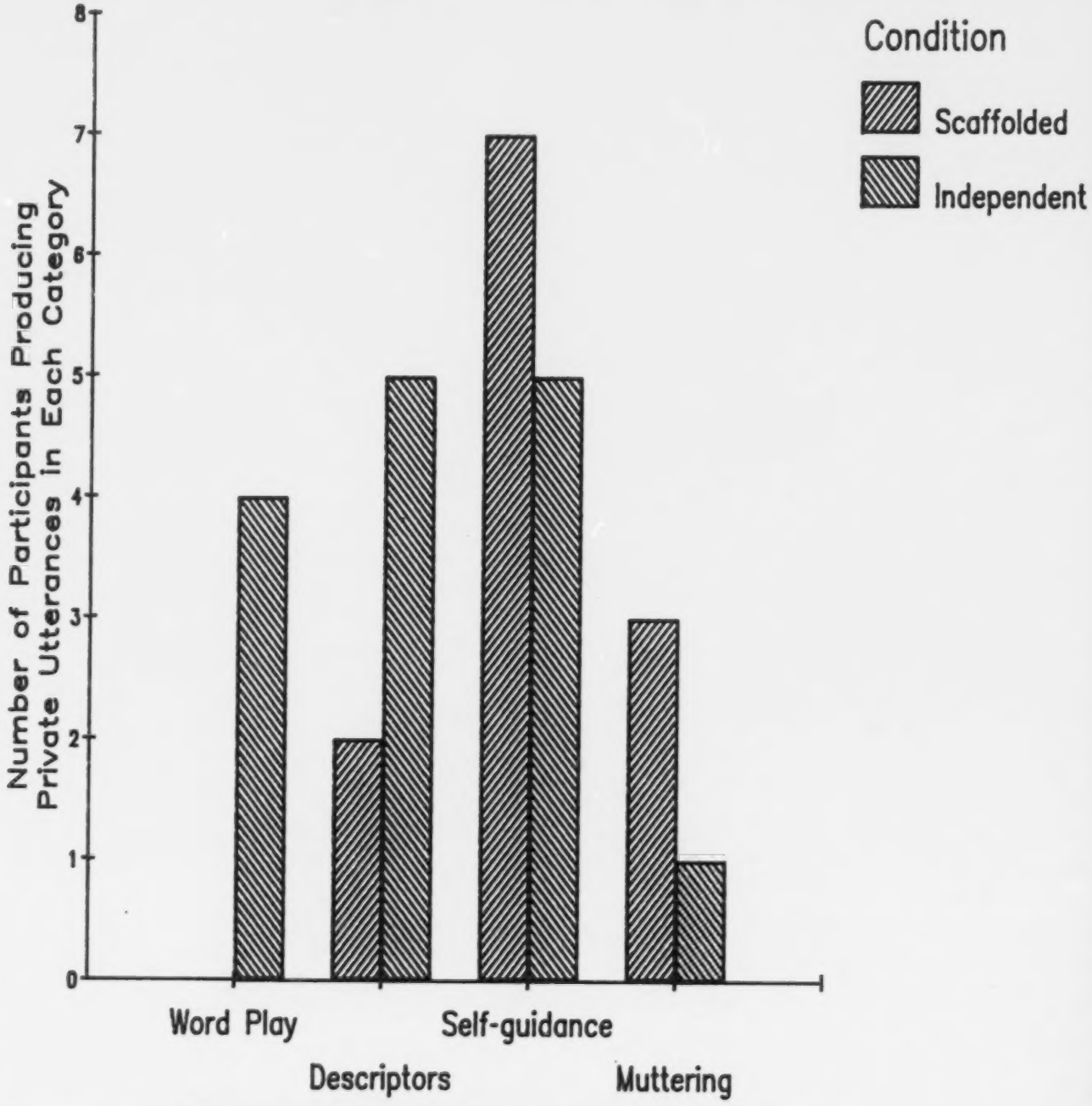

Figure 4
Private Speech Categories Across Sessions